

History of Ophthalmology

The eye and its diseases in Ancient Egypt

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ABSTRACT. Based on a study of mummies, skeletons, burial rites, medical instruments, medicaments, literature and objets d'art from Ancient Egypt before the Hellenistic Period, the understanding of the eye, its diseases and their treatment at that time is described. Magic spells, religious rites and medical treatments, especially with eye ointments, were probably used often complementary to one another. We must be very cautious about our conclusions in regard to the effectiveness of the treatments. Eye diseases have been depicted only exceptionally in Egyptian art, except for blindness and 'symbolic blindness'.

Key words: History of ophthalmology - eyes in Ancient Egypt - eye diseases in Ancient Egypt - porotic hyperostosis - mummification.

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From ancient times the eye has been not only an organ of vision but also a symbol of importance in the cults of peoples. This also holds true in Ancient Egypt.

Material and Methods

This work is based on a study of mummies, skeletons, burial rites, medical instruments, medicaments, literature and objets d'art from Ancient Egypt before the Hellenistic Period.

The sensitive *ocular structures*, especially the retina, decompose very quickly, so with respect to ocular diseases, we have to rely mainly on the vast corpus of Egyptian literature.

Pathological changes in *orbital bones* are described on page 341.

We have no evidence of autopsies being performed in Ancient Egypt.

Burial rites

One of the best ways of learning about the culture of ancient Egypt is to study their burial rites.

Natural preservation of the deceased was achieved at an unknown date in the Predynastic Period, thousands of years ago, by simply burying the dead body in

the warm, dry sand of the Egyptian desert.

Artificial embalming was practised by royalty and the upper classes from the 4th dynasty (about 2575 B.C.).

Embalming, using natural natron, oils and ointments, was considered a religious rite of great importance for the continued life of the soul (Herodotus, about 450 B.C., Goyon 1972; Peck 1980). Embalming usually took 70 days after removal of the internal organs. Diodorus, some four hundred years after Herodotus, adds inter alia that the professional artisan, the 'ripper-up', who cuts the left flank of the mummy, at once takes flight to escape being pelted with stones, probably a survival of an old ritual. It was considered a sin to injure a dead body.

As a symbol of the soul, the heart was imagined as being carefully weighed by the god of the dead, Anubis, in the presence of the god of wisdom, Thoth, and a panel of judges headed by Osiris, king of the dead (The book of the dead, cit. Allen 1974). The intention of the trial was to assess whether the deceased was worthy of entering the Field of Reeds (the Yaru Fields), the Egyptian equivalent of the Elysian Fields (Andrews 1992a).

The embalming was in fact performed by a priest wearing an Anubis mask (a

jackal's head). The internal organs except for the heart were removed through an incision in the lower abdomen and dried out in natron, as was the corpse itself. When the organs were dehydrated they were soaked in resins, wrapped in linen bandages into four separate packages and stored in four canopic jars protected by the four sons of Horus: Imsety, Duamutef, Qebehsenuef and Hapy (Andrews 1992b; Lucas & Harris 1962a).

Artificial eyes

During the 13th dynasty (about 1750 B.C.), onion skins were sometimes placed *over the eyes of the deceased*. From the Ramesside Period (about 1150 B.C.), *artificial eyes* with obsidian pupils and alabaster whites might be placed in the apparently empty orbits, covering the shrunken remnants of eyes (Andrews 1992b). Later, even glass was probably used (Lucas & Harris 1962b), but there appears to be no positive evidence that living Egyptians ever wore artificial eyes (Ry Andersen 1994a).

From the 4th dynasty, *coffins, mummy masks, reliefs and statues were often provided with painted eyes*. In the 5th dynasty the statues often had inlaid eyes, e.g. of rock crystal (Manniche 1994a), perhaps for magical purposes.

The painted limestone bust of Queen Nefertiti (from the 18th dynasty, about 1355 B.C.), now in the Ägyptisches Museum in Berlin, was found in el-Amarna in 1912 in the workshop of the famous sculptor Thutmose. In the right orbit can be seen a beautiful eye made of a sliver of rock crystal, on the reverse of which a pupil and an iris are painted. In the left orbit only the white limestone is visible, without painting or the addition of other material (Fig. 1). Scientists have expended their energy and imagination in trying to explain the kind of eye disease the artist might have tried to illustrate. Perhaps Thutmose kept the bust in his

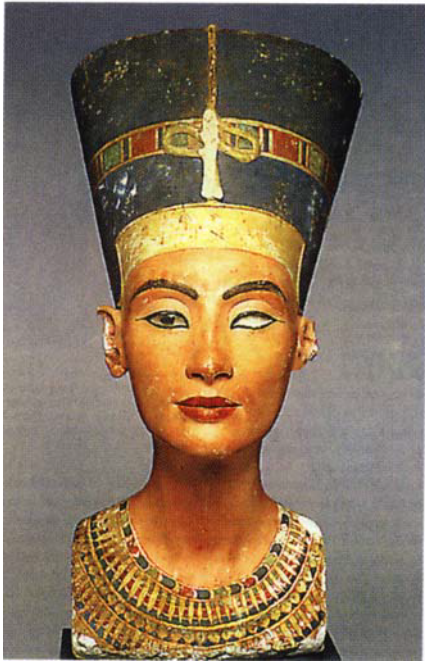


Fig. 1. Painted limestone bust of the Egyptian Queen Nefertiti, 18th dynasty, about 1355 B.C. No artificial eye or painting in the left orbit. (From Anthes, 1986, p 13. Courtesy of the Ägyptisches Museum, Berlin. Photo: Margarete Büsing).

workshop as a studio model for other Nefertiti busts, finding it unnecessary to insert more than one eye (Anthes 1986).

Magic eyes

From the Middle Kingdom (about 2040 B.C.) onwards, two eyes were often painted on the head end of coffins or sarcophagi above an elaborately painted 'False Door', which marked the limit between the worlds of the living and the dead. The painted eyes, the *udjat*-eyes, enabled the dead to look out at the world. In addition, the *ba* (the liberated, wandering, divine 'soul') and the *ka* (the creative, spiritual force of the human host) of the deceased were able to walk among the living and receive their offerings, and then return to the mummy of the deceased. The statue of the deceased, his name on the coffin, his mask and the representations of him on the walls of the tomb helped the *ba* and *ka* to identify their own mummy (Andrews 1992c).

The 'evil eye' is a well-known phenomenon in all cultures, and has been feared as causing injury to human beings, animals and crops. The Egyptians tried to ward off the injury in many ways, for example by using amulets of an eye, the Horus eye (the *udjat* eye). In the Old Kingdom Horus was considered an important sky-god. His right eye was the sun, his left eye was the moon. In a later



Fig. 2. Embalming equipment from Deir el-Bahri, Thebes. Above, wax embalming plate bearing the *udjat* eye to protect the embalming incision. Wax figures of the four sons of Horus and linen bag containing natron crystals. All after 1000 B.C. (From Andrews 1992 b, p 22. Courtesy of the British Museum).

tradition we meet Horus in many different legends. Horus was often the protector of the fertile valley of the Nile. In his eternal struggle with his uncle Seth, the evil God-of-the-Desert, Horus lost his left eye. Thoth, as well as being the god of wisdom, was the patron of physicians and writers (Deines et al. 1958a), and he re-created Horus' left eye. Since then, the eye of Horus, usually the left eye, was called the *udjat* eye. *Udjat*, in fact, means 'that which is whole or sound'. Probably

the change of the moon from sickle to full moon has inspired this part of the Horus myth.

The *udjat* eye had protective powers, not only against eye diseases but also against many other diseases and disasters, such as the 'evil eye' and demons. Instead of offerings, an amulet formed as an *udjat* eye was often placed between the linen bandages of the mummy. Fig. 2 shows embalming equipment, including a wax plate bearing the *udjat* eye to protect

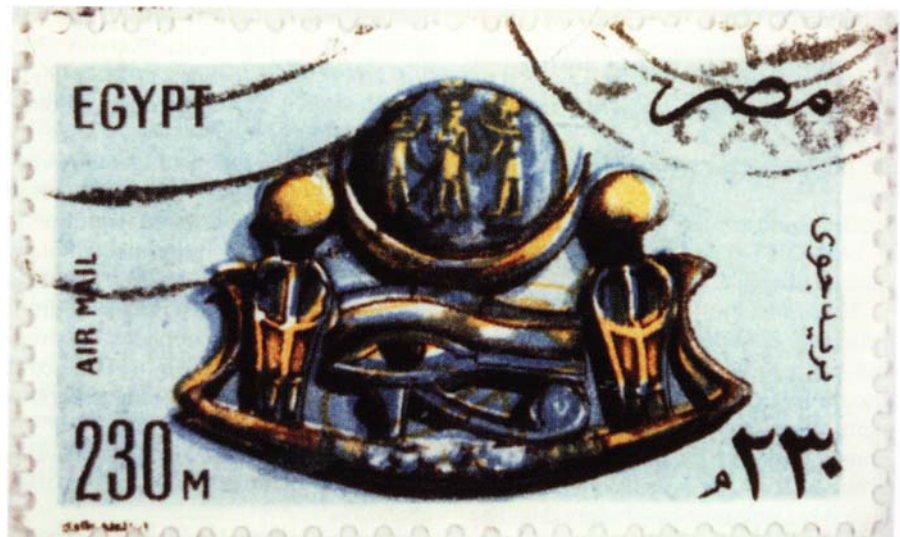


Fig. 3. An Egyptian stamp from 1985. In the middle of the sun boat an *udjat* eye is depicted. Part of breast ornament in Tutankhamun's tomb.

the embalming incision of the body. The *udjat* eye is still in use as a symbol (Fig. 3).

Eye diseases

Eye diseases were undoubtedly very common in Ancient Egypt. Various eye diseases are described very briefly, especially in the Ebers Papyrus (about 1525 B.C.), but most of our information comes more indirectly from medical prescriptions in this papyrus and others. It is usually very difficult to identify the diseases. I agree with the critical medical historians Grapow (1954), Sigerist (1951a) and Nunn (1996) that we must take many postulates from other historians with a grain of salt.

A good example is a very important quotation from the Ebers Papyrus (Deines et al. 1958b) about the disease '*h.t.*: 'Ein anderes (Heilmittel) für das Beseitigen einer Stauung (English accumulation) von Wasser in den beiden Augen'. Our ophthalmological Nestor of medical history Professor Hirschberg (1899) translates with the same caution: 'Aufsteigen von Wasser in die Augen' (English, ascent). Other translators such as Ebbell (1937) interpret the '*h.t.*' disease as cataract. Like Hirschberg, I find this translation unscientific and incorrect, and the later Roman translations of the term as 'suffusio' and 'fluxiones' appear meaningless to me. The '*h.t.*' disease might concern both glaucoma and cataract, and like all other peoples the old Egyptians were unable to distinguish between these groups of diseases (Ry Andersen 1994b).

In Chapter II B, The Eyes, by Deines et al. (1958c) a series of eye diseases and their treatment is described.

Sickness in the eye, *3d.t.* and *3dj.t.* is interpreted by Waugh (1995a) as 'severe ophthalmia'.

Blood, haemorrhages and 'blood vessels in the eyes' are mentioned, as well as *excessive lacrimation and pain in the eyes*.

Burning, heating and flush in the eyes are probably expressions for *inflammations*.

Albugines, (*shdw* disease) (Deines et al. 1958d, 1973) probably means *corneal scars or leucoma*.

'*Egyptian eye disease*', *trachoma*, caused by *Chlamydia trachomatis*, was, and still is, a very common and serious disease in Egypt. This disease has certainly been known since the time of the Roman physician Galen (131-201 A.D.) (Kühn 1826; Arrington 1959), but it was probably a nuisance long before this. The *wh3.t* disease, Ebers 346 (Deines et al. 1958, IV, 1, p 44), is an insecure diagnosis, by some interpreted as trachoma. I



Fig. 4. Porotic hyperostosis (cribra orbitalia, Welcker's disease), with honeycomb-like hyperplasia of the orbital roof (arrows). Danish case from Himmelev church of a 4-year-old child dated from the Middle Ages. (Photo and courtesy of Dr. P. Bennike, the Anthropological Laboratory, University of Copenhagen).

agree with Waugh (1995b), in his gentle remark 'conjunctival unevenness'. Trachoma is of course a possibility. *Trichiasis and blindness* were often the final result. Trichiasis was treated by removal of the cilia and with various ointments to prevent recurrence.

Corneal ulcers, scars, blepharitis, sty, chalazion, pinguecula, xanthelasmata and tearful eyes have been inferred by Leca (1971a) among others. There is no mention of any type of surgical intervention.

Contraction of the pupil or iris (dfd) - perhaps a symptom of *iridocyclitis* - is mentioned in the Ebers Papyrus 345 (Grapow 1956a; Deines et al. 1958e). The treatment was application of ointments.

It is scarcely possible to identify a disease called '*blindness owing to a small ball in the eyes*' (*šp.t.*), treated with ointment of dried resin and fermented plant mucilage (Deines et al. 1958f) (A nucleus of a Morgagnian cataract is a possibility).

The same difficulty applies to '*prevention of flesh in the eyes*' (*hsf.w*) (Deines et al. 1958g). Waugh (1995c) suggests pterygium.

Pds.t. disease 'a small ball in the eye' is interpreted by Waugh (1995d) as sty, chalazion.

Night blindness treated with ox liver is often mentioned in the literature of today. The Ebers Papyrus 351 and London 35

(Deines et al. 1958h) recommend local application of roasted liver for the *š3rw-(šl-)* disease in both eyes and the treatment was said to 'have an excellent and immediate effect'. Unlike Leca (1971b) and Waugh (1995e), I find nothing to indicate that the descriptions deal with night blindness.

Ova of *Schistosoma* and *Taenia* have often been identified in mummies from Ancient Egypt, but the Egyptian physicians would scarcely have been able to diagnose the ocular complications of these diseases.

In the Kahun Papyrus 1 (Deines et al. 1958i), a woman was recommended to eat raw donkey liver against a severe *bilateral eye disease with blindness and 'pain in the neck' resulting from a disease of the uterus*. Her vulva was to be treated with resin from terebinth in 'new oil' and the eyes bathed with a solution of bones from a bird. Leca (1971c) suggested the possibility of iritis caused by gonorrhoea. Other theoretical possibilities are a herpes virus or a chlamydia infection.

Trauma and other injury of the eyes are often mentioned. An interesting case in the (Edwin) Smith Papyrus 8 (Deines et al. 1958j), describes a *cranial fracture with one-eyed divergence and paralysis of the foot, both on the same side*. This is possibly a case of contrecoup-lesion with trauma of the opposite side of the brain (Westendorf 1966). A bleeding from both

nostrils and ears confirms the severe cranial trauma.

The Ebers Papyrus often mentions *blurred vision* (*h3tj*), *weakness of sight* (*h3rw*), *darkness* (*kkw*) and *'blindness'* (*šp.t*) (Deines et al. 1958k,f). The different forms of impairment of vision have often been treated with exorcism, magic spells and various ointments in order to improve the vision.

The existence of *malignant tumours in the eyes or orbit* has never been proved in Egyptian mummies or skeletons.

Orbital diseases

A peculiar disease or group of diseases has very often been recognized in bones thousands of years old. The disease is most frequently localized to the orbital roof, hence the old name *Cribra orbitalia*, *Welcker's disease*. Welcker described (1888) the honeycomb-like orbital and cranial disease in 625 crania from all over the world, usually in children and young persons (Fig. 4). In 'Old Egypt' he found the disease in 7.6% and in 'New Egypt' and Nubia in 11.5% of all crania from children investigated. In Denmark, Møller-Christensen (1961) found *cribra orbitalia* in about 20% of all early age-groups, but it was more common (70%) in skulls with leprosy faces than in cases without these pathognomonic bony changes. In later years, the disease is usually called *porotic hyperostosis* (Angel 1966), a better term. It is probably a *multifactor disease* (Ry Andersen 1994c). Most cases are probably caused or influenced by infections of many kinds which cause severe anaemias, especially by intestinal parasites. In addition, malnutrition, iron deficiency, social and hygienic factors, population density and customs may affect children, especially in a critical period between the ages of six months and twenty-four months.

We know nothing about damage to the vision in ancient times, but many children died with pronounced cranial manifestations of porotic hyperostosis, the common denominator being hyperplasia of the bone marrow.

Some rare childhood diseases involving hyperplasia of the bone marrow are seen today, including some *recessive hereditary haemoglobinopathies* which are endemic in malarial areas. In Denmark, they are seen most often in children immigrating from Eastern Mediterranean countries (Wimberley et al. 1989). They are found almost everywhere in the world, and they often seem to have a distribution similar to porotic hyperostosis. Severe damage to the eyes is rarely seen,

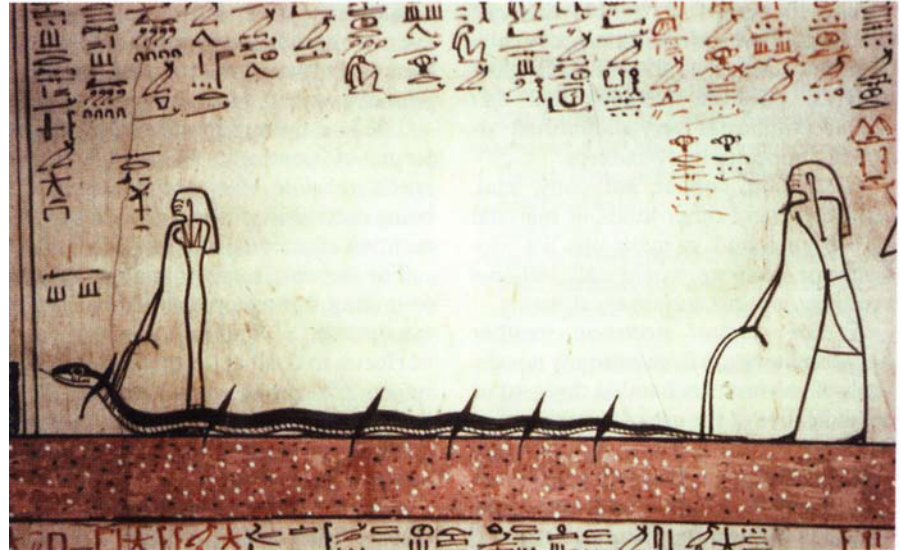


Fig. 5. The mythical demon Apophis in the shape of a giant serpent was an enemy of all righteous. Magic spells and mutilations of images of the serpent were believed to protect the sun god Ré and the dead during their dangerous voyage through the underworld. The painting from Tutankhamun's tomb illustrates the serpent being hacked to pieces. (Courtesy of the Carsten Niebuhr Institute, Copenhagen).

but thalassaemia and sickle-cell disease have a high mortality.

At present, the relationship between the two groups of disease is uncertain.

Treatment of eye diseases

Topical treatment of eye diseases was very often used in Ancient Egypt. In 'The compilation of handwriting about the eyes' (in German: *Sammelbuch der Augen*) (*dmd.t*), 95 prescriptions for eye diseases are mentioned (Grapow 1955). The prescriptions are described in full by Deines et al. 1958c.

As a rule, *ointments* called *collyria* were used, applied directly to the 'exterior' of the eyes. More rarely, eyedrops were instilled. Some ointments were recommended especially during winter months. Honey was used in many ointments, partly in order to obtain the proper consistency and (perhaps) partly because of its bactericidal effect. In addition, honey was thought to have an effect upon demons (Rand Nielsen 1986). The characteristic black or - sometimes - green painting of the eyelids and margins was not only a sacred rite (re-creation of the sacred eye of Ré, Bunson 1995), but part of a more or less rational treatment involving antibiotic elements such as allicin from garlic (Münchow 1984).

The ointments often included *extracts from plants* such as: resin from terebinth, gum from *Cistus ladanum*, leaves from papyrus and other plants, castor oil, seeds, wheat and juice from dates.

Grated minerals were often added, e.g.

green copper carbonate, red natron, 'mineral from upper and lower Egypt', granite, flint, ochre, lead, alum, lapis lazuli and chalcidion (a variety of quartz).

Animal materials consisted of extract from crocodile, fly, gall from fish, goose, heron, mussel, pig, tortoise, vulture and - very often - goat. Bone marrow and extract from donkey teeth were also used.

Extract from healthy pigs eyes mixed with 'genuine black eye make-up', red ochre and honey poured into the ear (!)

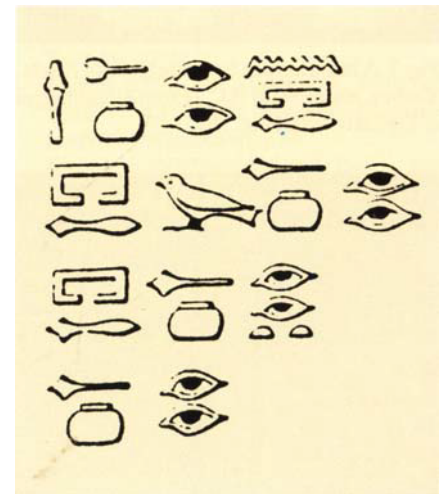


Fig. 6. Titles of oculists in Ancient Egypt, Old Kingdom, about 2650 to 2150 B.C. Above the Egyptian hieroglyphs. The titles in English modified by me from top: Commander of the palace oculists, chief of the palace oculists, palace oculist and oculist. The pecking-order of the hierarchy was already known at that time. (From Watermann 1958, p 123).

were used against 'a terrible disease', blindness (*šp.t*), with the comment 'really excellent' (Deines et al. 19581). Grapow remarks, however, (1956b) that *šp.t* probably indicates very diminished vision but not complete blindness.

In addition, copper, antimony, lead, manganese and other kinds of material have been found in make-ups, i.e. elements of what we would call 'rational treatment' against certain eye diseases.

As for *surgical treatment*, neither Egyptian literature from antiquity nor the oculists' instruments handed down to us are indicative of the use of cataract operations (Hirschberg 1899; Ry Andersen 1995). *Epilation* was performed with tweezers. A gaping wound above the eyebrows was stitched (Nunn 1996).

Make-up of the surroundings of the eye was an important task usually performed by the physician, like *treatment with ointment and powdering*.

I believe we must imagine the various forms of treatment mentioned, *magic spells, religious rites and ointments*, as being used against disease, often supplementing one another.

For example, a *spell* had to be spoken four times during topical treatment of an eye disease: 'Welcome, thou splendid eye of Horus, to combat the threat from a god or goddess... to the eyes of this man. Protection behind (me), protection, (here comes) protection!' (Deines et al. 1958m).

Another *spell* was used to chase away a disease from a child: 'Flow out, thou

demon who comes in darkness... I have prepared a protective amulet for it (the child) against you, made of evil-smelling herbs, of garlic which hurts thee (the demon) and of honey which is sweet for men but horrible to ghosts, and of the jaw of a crocodile (?) and of a backbone of a perch' (Manniche 1995).

The Egyptian art of medicine consisted in selecting the right drugs, preparing them in a magically correct way and speaking the appropriate words over them. Perhaps we touch here upon *the origin of the pharmacological therapy of Egyptian medicine* (Sigerist 1951b).

Presumably, the ancient Egyptians considered eye diseases and other *illnesses as expressions of an invisible, magical influence* (Fig. 5). The outward, more



Fig. 7. A blind harpist from the tomb of Nakht, Thebes, about 1400 B.C. (From Ghalioungui & Dawakly 1965, Fig. 70).

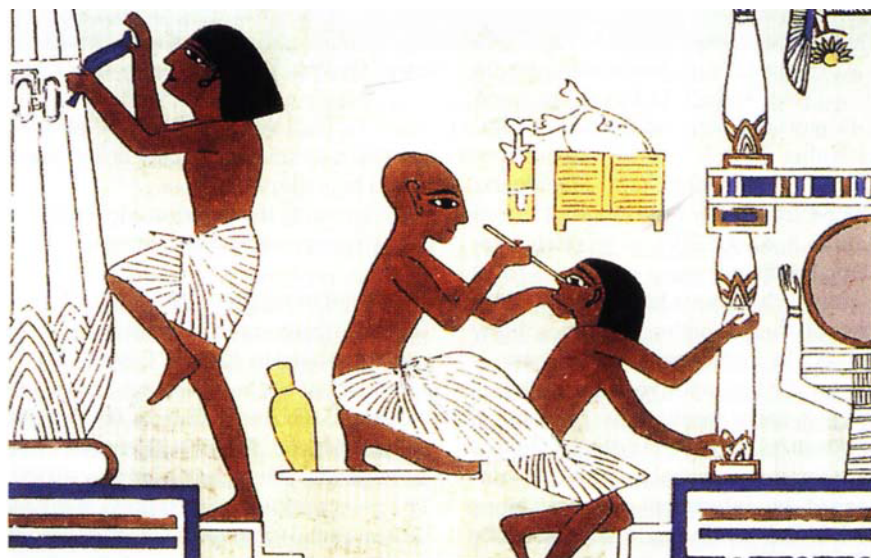


Fig. 9. A wallpainting in the tomb of the master builder Ipwy at Thebes, about 1200 B.C. An oculist treats the eye of a craftsman. (Modern copy of the painting at the entrance to the Cornea Bank at Ain Sham's University Hospital, Cairo. Photo: N. Kalstrup, Aalborg).



Fig. 8. Male musicians with a band tied over their eyes (arrows) ('symbolic blindness'). Two blocks of sandstone from Amenophis IV/Akhenaten's sun temples in Karnak, about 1365 B.C. (Photo and courtesy of Dr. L. Manniche, Carsten Niebuhr Institute, Copenhagen).

visible aspect was probably less essential (Iversen 1948).

The use of 18 different magical ointments applied to the skin against demons speaks for itself (Deines et al. 1958n; Ry Andersen 1997).

Some patients consulted *physicians* (*swnw*), others sought advice from *priests* or *healers* (Sigerist 1951c). Some physicians functioned as both Sachmet priests and sorcerers, and they often prepared their drugs themselves (Kolta 1979; Grapow 1956c; Deines et al. 1958o). Other physicians also worked as scribes. The title oculist (*swnw-irty*) was known since the Old Kingdom (Watermann 1958) (Fig. 6). But the subject of the titles is far from clear (Ghalioungui 1983).

Effectiveness of eye treatments

It is very difficult to estimate the effect of the various treatments. We have to be careful in drawing conclusions and in using modern terminology taken from our way of thinking (Sigerist 1951a).

The *psychological placebo effect* is undoubtedly the greatest, whatever the method used, apart from some minor surgical treatments such as epilation.

The texts handed down to us are very scanty and vague for estimating the effect. A sentence such as 'really excellent, a million times' about an ointment is not very precise.

The effect of what we would call *attempts at 'rational medicine'* is also uncertain. A substance such as copper undoubtedly has a theoretical possibility of influencing trachoma, as well as other granulomatous conjunctivitis cases. But we know extremely little about the concentrations of the various ointments and the duration of the treatments.

Cleanliness was important, and considered a religious and hygienic necessity.

Eye diseases in Egyptian art

As in most other countries, eye diseases were only exceptionally depicted by Egyptian artists in antiquity. Only blindness (Fig. 7) and 'symbolic blindness', especially in musicians, are occasionally depicted in tombs. Sometimes, male musicians were shown with a white band tied over their eyes (Manniche 1978, 1994b) (Fig. 8).

A wall painting in the tomb of the master builder Ipwy (about 1200 B.C.) reveals an oculist treating the eye of a craftsman. A basket of drugs behind him suggests the high standards of the oculist (Fig. 9).

It is interesting that pronounced bilat-

eral exophthalmus is often portrayed on reliefs and statues from the 4th dynasty (Ghalioungui & Dawakly 1965). I have noticed exophthalmus many times in Egyptian museum items, but never indisputable signs of goitre. According to Greenwald (1949), there is no evidence of goitre in Ancient Egypt, and I cannot quote instances in support of a rite. Personally, I am most inclined to believe that it was an artistic convention. And, as so often, we must refrain from positive conclusions.

In general, I can only say with Shakespeare's soothsayer in Antony and Cleopatra, Act I, Scene 2, First Folio, 1623:

In Nature's infinite book of secrecy
A little I can read.

Acknowledgments

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- Idem d: p 48. Ebers 402 (62, 4-5) and p 49. Ebers 360 (58, 6-15), both *shdw.*
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